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**REMARKS**

**Introduction**

By this Response, applicant has amended claims 51, 52, 61, 73 and 74, cancelled claim 76 and 77, and added claims 78 through 90<sup>1</sup>, as well as new claims 91-96<sup>2</sup>. Applicant has also made amendments to the specification. Claims 51-75 and 78-96 are now pending in this application, and applicant respectfully requests the allowance of these claims. The amendments to the specification and the Listing of Claims set forth above are in compliance with 37 CFR 1.121 and MPEP 714 (Rev. 2 May 2004).

For the most part, applicant's arguments for patentability are based on the independent claims. To the extent that the arguments are silent about the corresponding dependent claims under rejection, applicant submits that the corresponding dependent claims are patentable for the reasons advanced in support of the patentability of the corresponding independent claim.

During the prosecution of U.S. Patent No. 6,693,054 B1 to Yeckley, the parent patent to the present patent application, applicant submitted a DECLARATION OF RUSSEL L. YECKLEY signed on June 5, 2003 (hereinafter Yeckley Declaration). For the convenience of the Primary Examiner, a copy of this Yeckley Declaration is an attachment hereto as EXHIBIT 1. In the Yeckley Declaration, the inventor presented his opinions about certain ones of the applied patents, and from time-to-time in this Response, applicant will refer to the Yeckley Declaration.

Finally, applicant points out that, in addition to providing support for claims 91-96 as discussed hereinafter, the x-ray diffraction data presented as an amendment to the specification also shows that the beta silicon nitride content in the starting silicon nitride powder makes a difference in the resultant ceramic. One can easily see that even though the compositions are the same, except for the beta silicon nitride content, the amount of alpha SiAlON phase in the two phase composite, the composition of the alpha SiAlON phase itself,

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<sup>1</sup> Support for claims 83-86 is found at page 32, lines 30-32 of the specification. Support for claims 78-82 and 87-90 is found at page 9, line 37- page 10, line 11 of the specification.

<sup>2</sup> New claims 91-96 are the subject of a discussion later in this Response.

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the composition of the beta SiAlON phase itself, and the ytterbium content in the grain boundary are impacted by the content of the beta silicon nitride in the starting silicon nitride powder. This kind of evidence addresses the issues raised by the Primary Examiner's citations of In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990); In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980); and In re Swinehart, 439 F.2d 2109, 169 USPQ 226 (CCPA 1971).

**Affirmation of the Election of Claims 51-75**

Applicant affirms the election of claims 51-75. The Primary Examiner should note that applicant has also cancelled claims 76 and 77, that were withdrawn from consideration, so as to place the application in better form for allowance.

**Rejection of Claims Per Paragraph 6 of the Office Action**

Claims 51-64 and 73-75 stand rejected under 35 USC §112, 2d ¶. Although applicant respectfully submits that the claims comply with the requirements of 35 USC §112, 2d ¶, in order to further the prosecution applicant has made the following amendments to the claims:

- Claims 51 and 73 have been amended per the Primary Examiner's suggestions;
- Claims 52 and 73 have been amended to address the antecedent basis issue; and
- Claims 61 and 74 have been amended to be in independent form so as to eliminate any issue raised by the Primary Examiner.

Applicant submits that the above amendments should overcome any of the bases for the rejections under Paragraph 6 of the Office Action, and applicant respectfully solicits the removal of these rejections.

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**Rejection of Claims Per Paragraph 9 of the Office Action**

Claims 51-58, 61-64, and 73-75 stand rejected under 35 USC § 102(b), or in the alternative under 35 USC § 103(a), over Chen et al. (U.S. Patent No. 5,908,798). Applicant respectfully disagrees with this rejection for the reasons set forth hereinafter.

The independent claims under rejection read [in part] as follows:

51. A SiAlON ceramic body made from a starting powder mixture that includes silicon nitride powder and one or more powders that provide aluminum, oxygen, nitrogen, and a rare earth to the SiAlON ceramic body, the SiAlON ceramic body comprising: ... the starting silicon nitride powder comprises at least about 70 weight percent of the starting powder mixture, the silicon nitride powder in the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder; and ...

61. A SiAlON ceramic body made from a starting powder mixture that includes silicon nitride powder and one or more powders that provide aluminum, oxygen, nitrogen, and a rare earth to the SiAlON ceramic body, the SiAlON ceramic body comprising: ... the silicon nitride starting powder contains about zero weight percent beta silicon nitride.

73. A ceramic body made from a starting powder mixture that includes silicon nitride powder, ytterbium oxide powder, and at least one or more powders together containing aluminum, oxygen and nitrogen, the ceramic body comprising: ... the starting silicon nitride powder comprises at least about 70 weight percent of the starting powder mixture, the silicon nitride powder in the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder.

74. A ceramic body made from a starting powder mixture that includes silicon nitride powder, ytterbium oxide powder, and at least one or more powders together

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containing aluminum, oxygen and nitrogen, the ceramic body comprising: ... the starting silicon nitride powder contains about zero weight percent beta silicon nitride.

Chen et al. discloses a starting silicon nitride powder that has a high beta silicon nitride content. This is shown by the description found at Col. 5, lines 5-51. In particular, the silicon nitride starting powder is beta silicon nitride that comprises 93 weight percent beta silicon nitride and 7 weight percent alpha silicon nitride. The use of such a silicon nitride starting powder is just the opposite of the present invention that claims a starting silicon nitride that has a beta silicon nitride content that is: (1) less than or equal to about 1.6 weight percent of the silicon nitride starting powder (see claims 51 and 71) or (2) about zero beta silicon nitride content (see claims 61 and 74). At Paragraph 24, the Yeckley Declaration supports the position that Chen et al. does not address the present invention.

Even though the claims pertain to a ceramic body, the recitations about the beta silicon nitride content in the starting silicon nitride powder are positive claim recitations that the Primary Examiner must consider in the patentability analysis. See MPEP 2143.03 (Rev. 2, May 2004) at page 2100-133; In re Wilson, 424 F.2d 1382, 165 USPQ 494 (CCPA 1970); In re Sabatino, 480 F.2d 911, 178 USPQ 357 (CCPA 1973).

Applicant respectfully requests the removal of the above rejections for the reasons expressed above.

**Rejection of Claims Per Paragraph 10 of the Office Action**

Claims 51-53, 60, 61 and 62 stand rejected under 35 USC § 102(a or e) in light of Tien et al. (U.S. Patent No. 6,124,225). Applicant respectfully submits that this rejection lacks merit for the reasons expressed hereinafter.

Independent claim 51 recites [in part]:

51. A SiAlON ceramic body made from a starting powder mixture that includes silicon nitride powder and one or more powders that provide aluminum, oxygen, nitrogen, and a rare earth to the SiAlON ceramic body, the SiAlON ceramic

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body comprising: ... the starting silicon nitride powder comprises at least about 70 weight percent of the starting powder mixture, the silicon nitride powder in the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder; and ...

Independent claim 61 recites [in part]:

61. A SiAlON ceramic body made from a starting powder mixture that includes silicon nitride powder and one or more powders that provide aluminum, oxygen, nitrogen, and a rare earth to the SiAlON ceramic body, the SiAlON ceramic body comprising: ... the silicon nitride starting powder contains about zero weight percent beta silicon nitride.

Tien et al. appears to disclose the UBE-10 silicon nitride powder and a preferred silicon nitride starting powder that contains 95 weight percent alpha silicon nitride and 5 weight percent beta silicon nitride. See Col. 4, lines 50-65. The UBE-10 silicon nitride powder appears to contain 2 weight percent beta silicon nitride<sup>3</sup>, and hence, does not address the instant invention per these claims, and the same is true for the above-mentioned preferred silicon nitride powder.

Applicant requests the removal of the above rejections for the reasons stated above.

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<sup>3</sup> See Paragraph 23 of the Yeckley Declaration that discloses that UBE-10 silicon nitride powder contains 2 weight percent beta silicon nitride.

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**Rejection of Claims Per Paragraph 11 of the Office Action**

Claims 51-58 and 61-75 stand rejected under 35 USC § 102(b), or in the alternative under 35 USC § 103(a), over Japanese Patent Document 5-43333 (JP '333) and Tanase et al. (U.S. Patent No. 4,547,470), each taken alone. Applicant disagrees with this rejection for the reasons set forth below.

As set forth hereinabove, claims 51, 65 and 74 recite that the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder; and claims 61 and 74 recite that the silicon nitride starting powder contains about zero weight percent beta silicon nitride.

In JP '333 the silicon nitride powder is described as " $\alpha$ '-silicon nitride (UBE Industries)", but there is no disclosure of properties or specific composition of the powder. Thus, the disclosure in JP'333 gives no guidance as to the beta silicon nitride content of this powder. However, the disclosure of the physical properties of the resultant ceramics in JP'333 (especially in view of the low  $\alpha$ '-SiAlON phase contents) provide evidence that the starting silicon nitride powder contains a higher beta silicon nitride content on the order of greater than or equal to about 2 weight percent beta silicon nitride.

In this regard, Table A sets out the starting materials and properties for these three examples.

Table A  
 Starting Materials and SiAlON Phases for Examples 4 and 1924D

Ex	Si <sub>3</sub> N <sub>4</sub>	Al <sub>2</sub> O <sub>3</sub>	AlN	Yb-Containing	$\alpha$ '-Phase	$\beta$ '-Phase
4	88.0	1.4	4.5	6.1	23% [25wt% of $\alpha$ '-SiAlON and $\beta$ '-SiAlON phases]	69% [75wt% of $\alpha$ '-SiAlON and $\beta$ '-SiAlON phases]
1924D	86.8	2.5	4.5	6.2	41.7%	58.3

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Referring to Paragraph 26 of the Yeckley Declaration, if the starting silicon nitride powder for Example 4 of JP '333 was a low beta silicon nitride, it would be expected that the alpha prime SiAlON content for Example 4 would be greater than that for Batch 1924D since the alumina content for Batch 1924D is greater than that of Example 4. This is because the presence of alumina typically results in a lower alpha prime SiAlON content. However, the alpha prime SiAlON content for Batch 1924D is actually greater than that of Example 4. As summed up in the last sentence of Paragraph 26, "[I]n my opinion, this difference in the alpha prime SiAlON content shows that the UBE silicon nitride powder used in JP'333 contained at least 2 weight percent (and possibly more than 2 weight percent) beta-silicon nitride."

In light of the above discussion, applicant submits that JP '333 does not address the present claims. See Paragraph 27 of the Yeckley Declaration which reads:

27. In light of the alpha prime SiAlON content and the nature of the starting silicon nitride powder for Examples 4 and 9 of JP'333, it is my opinion that the resultant ceramic of JP'333 would not present an unexpected increase in the alpha prime SiAlON phase content or present an unexpected elongation of the beta prime SiAlON phase grains so as to achieve an unexpected increase in the hardness and the fracture toughness of the ceramic material.

In regard to Tanase et al., this patent recites that the starting silicon nitride powder contains 10 volume percent beta silicon nitride and 90 volume percent alpha silicon nitride. For silicon nitride, the volume percent is about equivalent to the weight percent. Hence, Tanase et al. discloses that the starting silicon nitride powder contains about 10 weight percent beta silicon nitride.

In light of the starting silicon nitride powder, Tanase et al. does not address the present invention for the reason that Tanase et al. does not teach or suggest the use of a low beta silicon nitride starting powder. It is apparent that Tanase et al. does not address the present invention.

Applicant solicits the removal of the above rejections for the reasons expressed above.

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**Rejection of Claims Per Paragraph 12 of the Office Action**

Claims 51-75 stand rejected under 35 USC § 102(b), or in the alternative under 35 USC § 103(a), over Japanese Patent Document 2988966. Applicant respectfully submits that these rejections lack merit for the reason set forth hereinafter.

As set forth hereinabove, claims 51, 65 and 74 recite that the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder; and claims 61 and 74 recite that the silicon nitride starting powder contains about zero weight percent beta silicon nitride.

JP'966 uses a starting silicon nitride powder that contains 7 weight percent beta silicon nitride. As demonstrated by the patent specification and the test data reported in the Yeckley Declaration, the use of a silicon nitride powder that contains on the order of 7 weight percent beta silicon nitride powder will not achieve the present invention. Along this line Paragraph 22 of the Yeckley Declaration reads:

22. After a review of JP '966, it is my opinion that primarily due to the use in JP '966 of a starting silicon nitride powder that has about 7 weight percent beta silicon nitride (i.e.,  $\alpha$ -silicon nitride conversion of 93%), the resultant ceramic of JP '966 would not present an unexpected increase in the alpha prime SiAlON phase content or present an unexpected elongation of the beta prime SiAlON phase grains so as to achieve an unexpected increase in the hardness and the fracture toughness of the ceramic material.

In addition, JP'966 does not present any disclosure about the alpha prime SiAlON content or the fracture toughness or the hardness.

Applicant solicits the removal of this rejection for the reasons expressed above.



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**Rejection of Claims Per Paragraph 13 of the Office Action**

Claims 51-75 stand rejected under 35 USC § 102(b), or in the alternative under 35 USC § 103(a), over Yamada et al. (U.S. Patent No. 5,200,374) and Yoshimura et al. (U.S. Patent No. 5,369,065) each taken alone. Applicant respectfully submits that the rejections lacks merit for the following reasons.

As set forth hereinabove, claims 51, 65 and 74 recite that the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder; and claims 61 and 74 recite that the silicon nitride starting powder contains about zero weight percent beta silicon nitride.

Yamada et al. uses starting silicon nitride powders that all have beta silicon nitride contents greater than or equal to 2 weight percent beta silicon nitride. Yamada et al. does not address the low beta silicon nitride aspects of the claims. In this regard, See Paragraph 23 of the Yeckley Declaration.

In light of the nature of the starting powders of Yamada et al., applicant opines that the resultant product would not produce the instant invention. Paragraph 23 of the Yeckley Declaration reads [in part]:

... that because of the nature of the starting powders used in US '374; namely, an  $\alpha$ -SiAlON powder and the above-mentioned silicon nitride powders, it is my opinion that the resultant ceramic of US '374 would not present an unexpected increase in the alpha prime SiAlON phase content or present an unexpected elongation of the beta prime SiAlON phase grains so as to achieve an unexpected increase in the hardness and the fracture toughness of the ceramic material.

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Applicant submits that Yamada et al. does not address the claims under rejection.

Yoshimura et al. appears to teach the use of a starting silicon nitride powder that comprises 93% alpha silicon nitride and 7% beta silicon nitride. See Example 1 found at Col. 5, lines 37-41. Applicant submits that Yoshimura et al. does not teach or suggest the invention per the claims under rejection.

Applicant solicits the removal of these rejections for the reasons set out above.

**Provisional Rejection of Claims Per Paragraph 15 of the Office Action**

In regard to the rejection under Paragraph 15, applicant notes that the rejection is a provisional rejection. Applicant will await making a response depending upon the outcome of the pertinent prosecutions.

**Comments about Paragraph 16 of the Office Action**

Applicant has amended the specification per the Primary Examiner's suggestion.

**Discussion of New Claims 78-90**

Applicant submits that new claims 78 through 90 are patentable.

Claims 78-81 depend in some form from claim 51, and hence, are patentable for the reasons advanced in support of claim 51. Claim 82 depends in some form from claim 61, and hence, is patentable for the reasons advanced in support of claim 61.

Claim 83 recites that, "... the silicon nitride powder in the starting powder mixture contains beta-silicon nitride powder wherein the beta-silicon nitride powder comprises less than or equal to about 1.6 weight percent of the starting silicon nitride powder ...". For reasons along the lines as those set forth for the above claims, applicant submits that the applied references do not teach or suggest this recitation about the content of the starting silicon nitride powder. In addition, claims 84-90 depend in one form from claim 83, and hence, should be patentable for all of the reasons advanced in support of the patentability of claim 83.

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**Discussion of New Claims 91-96 Including the Amendment to the Specification**

New claims 91-96 call for limitations that, in addition to the lower beta silicon nitride content in the starting silicon nitride powder, pertain to the composition of the alpha SiAlON phase and the beta SiAlON phase, as well as the content of the alpha SiAlON phase as a part of the two phase composite. The prior art does not teach or suggest the invention as claimed in claims 91-96. Applicant solicits the allowance of these claims.

New claims 91-96 find specific support in the amendment to the specification beginning after Table 12 on page 31. Applicant submits that this amendment to the specification is not new matter for the reasons set forth hereinafter.

The data set forth in Tables 13 and 14 are the result of an x-ray diffraction analysis technique that was unavailable to the applicant as of the filing date of the parent patent application. Yet, the actual ceramic material presented in Tables 13 and 14 is identified and described in the parent patent application. More specifically, the four samples set forth in Tables 13 and 14 are 1145A, 1145B, 982 and 1374D. Each one of these samples is set forth

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in the as-filed parent patent application per Table B below.

Table B  
 Identification of Samples 1145A, 1145B, 982 and 1374D in Parent Patent Application

Sample/ (% Beta Silicon Nitride in Silicon Nitride Starting Powder)	Location in Parent Patent Application
1145A / 8	Page 18, Table 5 [Sample 11]
1145B / 2	Page 18, Table 5 [Sample 10]
982 / 1.6	Page 11, Table 1 [also Sample 9 in Table 5]
1374D / 0	Page 18, Table 5 [Sample 8]

Although the content of the beta silicon nitride varies, the composition of the starting powder for each one of these samples comprises in weight percent: silicon nitride (82.27%); aluminum nitride (5.97%); alumina (3.56%); and ytterbia (8.20%).

In Kennecott Corp. v. Kyocera Int'l Inc., 835 F.2d 1419, 5 USPQ2d 1194 (Fed. Cir. 1987), cert. denied, 486 U.S. 1008 (1988), the Federal Circuit held that claims that recited an "equiaxed microstructure" were supported by a parent patent application even though the parent patent application did not contain the term "equiaxed microstructure" when it was found that the product made and described in the parent patent application did exhibit an "equiaxed microstructure" as shown by photomicrographs contained in the continuation application to the parent application. Here, the situation is no different where claims 91-96 recite properties of some of the SiAlON ceramic materials made and described in the parent patent application; namely, Examples 982 and 1374D. Under the principle set forth in the Kennecott Corp. v. Kyocera Int'l Inc., decision, applicant submits that the amendment to the specification (the amendment to the specification is in compliance with 37 CFR 1.121 and MPEP 714 [Rev. 2 May 2004]) is not new matter and should be entered into the application.

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**CONCLUSION**

In conclusion, applicant submits that the pending claims are patentable over the applied patent documents. Applicant respectfully requests the removal of the rejections and the issuance of a Notice of Allowability and Notice of Issue Fee Due.

If the Primary Examiner should disagree with all or part of applicant's position set forth herein and have suggestions to place the claims in form for allowance, applicant urges the Primary Examiner to telephone either the undersigned attorney (615-662-0100) or Mr. John J. Prizzi, Esq. (724-539-5331).

Respectfully submitted,

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